



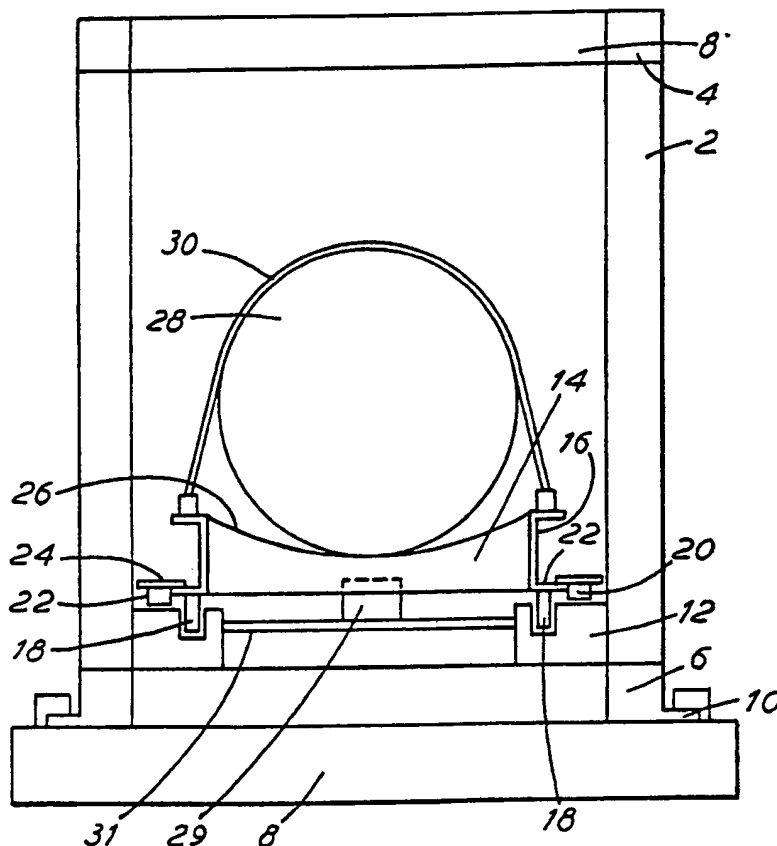
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(54) Title: APPARATUS FOR STOWING AND DEPLOYING STORES FROM AIR AND MARINE CRAFT

(57) Abstract

Apparatus for stowing and deploying stores from air and marine craft in which the stores (28) are stowed on a modular stowage structure, such as pallets (32), with releasable locking devices (10) securing the pallets to the craft. Further releasable locking devices (29) and restraining means (30) are arranged to secure the stores to cradles (14) on respective associated pallets. The pallets and cradles are adapted to permit, upon release of the respective further releasable locking devices (29), movement by the effect of gravity of the stores to effect deployment of the stores. The stowage structure may be mounted on a ramp on the deck of the craft or the pitch of the vessel may be adjusted to effect deployment. The structure may be releasably slung beneath a sub-surface craft and provided with a fibreglass casing to make it floatable.



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APPARATUS FOR STOWING AND DEPLOYING STORES
FROM AIR AND MARINE CRAFT.

DESCRIPTION

This invention relates to apparatus for stowing and deploying stores from air and marine craft.

In US Patent No. 4 161 301 there is disclosed

5. apparatus for stowing and deploying stores from aircraft and surface marine craft including modular palletised stowage of such stores. The stores are stowed on cradles mounted in pallets and releasable locking devices secure the pallets together and to the

10. craft. Rack and pinion drive mechanisms are provided to effect movement of the cradles relative to the pallets to a deployment position and to effect deployment. The rack and pinion drive mechanisms also serve to restrain movement of the cradles relative to

15. the pallets by constituting an irreversible drive between the racks, the pinions and the drive motors.

According to one aspect of the present invention there is provided apparatus for stowing and deploying

20. stores from air and marine craft including a modular stowage structure for such stores, the stores being stowed on the structure, with releasable locking devices securing the structure to the craft, in which further releasable locking devices are arranged to

25. secure the stores to respective associated portions of the structure and are adapted to permit, upon release of the respective further releasable locking devices, movement of the stores to effect deployment of the stores.

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According to another aspect of the present invention there is provided apparatus for stowing and deploying stores from air and marine craft including modular palletised stowage of such stores, the stores 5 being stowed on pallets, with releasable locking devices securing the pallets to the craft, in which further releasable locking devices are arranged to secure the stores to respective associated pallets and the pallets are adapted to permit, upon release of the 10. respective further releasable locking devices, movement by the effect of gravity of the stores to effect deployment of the stores.

According to yet another aspect of the present 15. invention there is provided apparatus for stowing and deploying stores from air and marine craft including modular palletised stowage of such stores, the stores being stowed on cradles mounted in pallets, with releasable locking devices securing the pallets 20. together and to the craft, in which further releasable locking devices are arranged to secure the cradles to respective associated pallets and the cradles and pallets are adapted to permit, upon release of the respective further releasable locking devices, 25. movement by the effect of gravity of the cradles relative to the pallets to a deployment position and, also by the effect of gravity, to effect deployment of the cradles.

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- According to a further aspect of the present invention there is provided apparatus for stowing and deploying stores from sub-surface marine craft including a stowage structure releasably locatable on
5. the sub-surface marine craft and provided with a hanger support having releasable hanger means for individual pendant support of respective stores.

- According to a yet further aspect of the present invention there is provided apparatus for stowing and deploying stores from sub-surface marine craft including a stowage structure releasably attachable to the underside of the sub-surface craft at five attachment locations, two of the attachment locations
15. being laterally spaced apart at the forward end of the structure, two of the attachment locations being laterally spaced apart at the aft end of the structure and the fifth location being adjacent the centre of the structure, attachment means at the fifth location being
20. engageable between the stowage structure and the sub-surface marine craft prior to engagement of attachment means at the fore and aft locations between the structure and the craft and dis-engageable subsequent to disengagement of the attachment means at
25. the fore and aft locations.

- According to another further aspect of the present invention there is provided apparatus for stowing and deploying stores from sub-surface marine craft
30. including a stowage structure releasably attachable to the underside of the sub-surface craft at attachment locations comprising aft facing L-shaped brackets

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- secured to sub-surface craft in laterally spaced apart pairs at longitudinal intervals from the forward end of the support structure, with link lugs provided on the stowage structure arranged to engage upon the L-shaped brackets and a retaining pin movable between a position engaging the stowage structure to restrain aftward movement of the stowage structure relative to the sub-surface craft and a disengaged position at which aftward movement of the stowage structure is permitted.
- 10.

- According to yet another further aspect of the present invention there is provided apparatus for stowing and deploying stores from aircraft and surface marine craft including modular palletised stowage of
15. such stores, the stores being stowed on cradles mounted in pallets and releasable locking devices secure the pallets together and to the craft in which further releasable locking devices are arranged to secure the cradles to respective associated pallets and the
20. cradles and pallets are adapted to permit, upon release of the respective further releasable locking devices, movement as a longitudinally connected string of the cradles by the action of a reciprocable pulling device connectable repetitively to a respective endmost cradle
25. to move the endmost cradle from the endmost pallet to a transfer station, means to effect transfer of the endmost endmost cradle from the transfer station to the deployment position and means to effect the deployment of the cradles from the deployment position.

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The invention will now be described, by way of example, with reference to the accompanying, partly diagrammatic, drawings, in which:-

5. Figure 1 is a side elevation of two standardised pallets having, intermediate therebetween, an extension pallet;

Figure 2 is an end elevation of a pallet with a
10. cradle in position;

Figure 3 is a cross-sectional side elevation of a means for restraining movement of the cradles relative to the pallets;

15. Figure 4 is a side elevation of a wedge shaped structure carrying a series of pallets;

Figure 5 is a plan view of a portion of an
20. alternative installation of pallets and associated structures suitable for a surface marine craft of the roll-on-roll-off type having a stern door;

Figure 6 is a side elevation of the installation
25. shown in Figure 5;

Figure 7 is a side elevation of further alternative arrangement suitable for utilisation in conjunction with a sub-surface marine craft; and

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Figure 8 is a cross-sectional end elevation of the arrangement of Figure 7, indicating in chain dotted outline a portion of the hull of the craft.

5. As shown in Figures 1 and 2, each pallet has a framework including upright stanchions 2 connecting upper and lower longitudinal stringers 4,6 and lateral cross beams 8 braced to form a rigid structure of standardized dimensions. The lower longitudinal
10. stringers 6 are formed with anchorages 10 for engagement with the craft, or, where the pallets are stacked, a subjacent pallet. The base of the pallet carries a longitudinal track 12 for an associated cradle 14 having laterally spaced longitudinal skids 16
15. and includes spaced pairs of rollers 18 on horizontal axes arranged respectively to engage the underside of the skids and spaced pairs of rollers 20 on vertical axes arranged respectively to engage outer flanged faces 22 of the skids, such that the cradle may roll
20. freely on the rollers upon releasing a detent provided to secure the cradle in register with the pallet. Flanges 24 on the vertically axled rollers 20 extend inwardly superjacent the outer flanged faces of the skids to restrain upward movement of the cradle.

25.

- Each cradle 14 is formed with support surfaces 26 for an associated store 28 and releasable restraining means 30 for securing the store to the cradle. A detent 29 mounted on a shaft 31 located on the
30. tracks 12 is rotatable from the position shown engaging, and restraining, the cradle 14 to a dis-engaged position in which the cradle is free to move along the tracks.

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- Since the pallets are of standardised dimensions, they are alignable longitudinally such that the cradles are movable from the rollers 18, 20 of one pallet on to the rollers the adjacent pallet, the skids 16
5. sequentially engaging the respective rollers.

- Where stores of greater length than a standardised pallet 32 are to be accommodated an auxiliary extension pallet 34 is connected at one end of the standardised
10. pallet.

- At the deployment position a deployment section (not shown) having a framework similar in form to that of the standardised pallet 32 is provided registering
15. with and connected to the endmost pallet. The deployment section includes sets of vertically and horizontally axled rollers (with flanges 24 omitted) together with actuating means to effect, where required, release of the restraining means securing the
 20. stores to the cradle and actuating respective devices associated with the stores during passage of respective stores through the deployment section.

- Movement of the stores, upon disengagement of the
25. associated detent 29, is initiated by gravity, with the pitch of the craft (particularly an aircraft) being adjusted to an inclination sufficient for the gravitational forces to overcome inertia and friction.

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As shown in Figure 3 means 36 for restraining movement of the cradles in a forward direction, that is, in a direction opposed to the direction of deployment, each include a pair of rollers 38 mounted on saddles 40 in a block 42. The blocks 42 are secured to respective pallets and the rollers 38 bear against the outer flanged faces 22 of the cradle skids 16. The blocks 42 are formed with tapered housings for the rollers 38 and the saddles 40 are spring biased such that, upon initial movement of the skids in a forward direction, the rollers jamb in the housing to prevent further forward movement. Movement of the skids in a rearward direction releases the rollers from the jammed position. It will be appreciated that the skids may readily enter the means 36 upon transferring cradles rearwardly towards a deployment position. To facilitate loading of cradles forwardly into the pallets, over-ride means 44 are provided to urge the rollers 40 apart.

20.

As shown in Figure 4, where it is not possible to vary the pitch of the craft to a sufficient inclination, such as with a surface marine craft, the pallets may be positioned on a wedge-shaped structure providing a suitable inclination. The wedge shaped structure is formed with framework structures of modular form having dimensions similar to that of the pallets and are provided with anchorages compatible with those of the pallets. Base modules 50 of parallelepiped form have form and dimensions

25.
30.

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corresponding to those of the pallets, whilst wedge modules 52 have a truncated wedge form with one end face having a greater vertical dimension than the other end face and the base face corresponding to that of the 5. base module.

Braking means are provided to retard movement of cradles within the pallets where it is required to release the cradles individually in sequence.

10.

In the alternative embodiment, shown in Figures 5 and 6, which is particularly suited for installation in a marine craft of the roll-on-roll-off type having a stern door, a multiplicity of pallets are juxtaposed in 15. longitudinal alignment in banks extending laterally and vertically, portions of only the lower banks being shown. The cradles 14 in longitudinally aligned pallets 32 are coupled together in strings with pin and socket devices 60 at forward and rearward ends of the cradles, 20. such that movement of the string is effected by pulling the endmost cradle 14.

A framework forming a transfer station 62 is secured to the endmost pallets and carries a 25. repetitively reciprocable hydraulic ram 64 connected to a pinion 66 of a fixed and free double rack and pinion drive 68 exhibiting a 2:1 linear movement enhancement. The free rack 70 has a head engageable with the socket device 60 on the endmost cradle of the string when the

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free rack is in a fully extended position. Upon retracting the ram 44 and the free rack 70 to a fully retracted position the string of cradles is pulled rearwardly to move the endmost cradle of the endmost 5. pallet to the transfer station 62.

Lateral transfer means 72 at the transfer station are arranged to raise the endmost cradle 14 slightly, to effect disengagement of the pin and socket coupling 10. device 60 with the adjoining cradle and the coupling with the head on the free rack, and to move the cradle laterally to a deployment position 74.

The deployment position 74 includes an overhead 15. endless chain conveyor 76 extending through and supported on a stern door frame (not shown) and having overhead carriages 78 provided with arms 80 for releasable engagement with transfer lugs 82 on the stores 28. Actuating means (not shown) are provided to 20. effect disengagement of the restraining means securing the store to the associated cradle simultaneously with engagement of the arms with the transfer lugs. The endless chain conveyor serves to carry the store rearwardly and deployment is effected aft of the 25. craft by trip releasing the arms 80 from the lugs 82.

The transfer station 62 is carried on a structure enabling the free rack 70 to be indexed in sequence into alignment with each of the strings of cradles in 30. the associated bank of pallets to effect pulling of the respective strings of cradles one by one from the associated pallets.

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Actuation of respective devices associated with the stores is effected either during lateral transfer to the deployment position or at the deployment position.

5.

Following disengagement from the store, the cradle is moved to a further roller track 84 for return to the forward ends of the pallets, there to be re-inserted into the pallet for subsequent re-use.

10.

Referring to the further alternative arrangement shown in Figures 7 and 8 a braced lattice stowage structure 86 of parallelipiped form is provided with attachment lugs 88 extending from upper portions

15. thereof for engagement with attachment means (not shown) on the underside of the sub-surface craft. An outer casing skin 90, such as of fibreglass, is provided around the lateral faces of the stowage structure remote from the sub-surface craft and
20. fairings 92, 94 are provided fore and aft such that a boat-like structure is formed. Anchorage locations are provided at intervals on the interior of the stowage structure to enable a multiplicity of pallets 32 to be stowed in the stowage structure.

25.

Movement of the stores, upon disengagement of the associated detent, is initiated by gravity, with the pitch of the craft being adjusted to an inclination sufficient for the gravitational forces to overcome

30. inertia and friction.

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- In operation, the stowage structure 86 is loaded with pallets 32, cradles 14 and stores 28 either on land or floating alongside a jetty. The loaded structure 86 is then transported or towed to a dock
5. and, if necessary, sunk. The stowage structure is then appropriately located on the floor of the dock and the sub-surface craft floated in above the stowage structure. The level of water in the dock is then lowered such that the craft settles on to support
 10. stocks on the base of the dock with the attachment lugs 88 on the stowage structure in alignment with the attachment means on the underside of the sub-surface craft, jacking means being used to provide small adjustments to the position of the stowage structure if
 15. necessary. Engagement of the attachment lugs with the attachment means is then effected and the level of water in the dock again raised to enable the craft to be floated out of the dock.
-
20. To effect deployment of the stores, the aft fairing 94 is jettisoned, the horizontal fore and aft pitch varied to an inclination at which movement by the effect of gravity, and also possibly the effect of drag, of the cradles 14 towards the deployment
 25. position, upon release of the further locking devices, occurs. The cradles are released in sequence until all of the stores 28 have been deployed, whereupon, if desired, the stowage structure 86 may be jettisoned by disengaging the attachment lugs 88 on the stowage
 30. structure from the attachment means on the sub-surface craft.

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In an alternative form (not shown) of the arrangement of Figures 7 and 8, secured to the upper stringers and cross beams of the pallets is a hanger support provided with releasable hanger means for

5. individual pendant support of respective stores. The portions of outer casing skin immediately subjacent each releasable hanger means are of frangible form. Alternatively, such portions may be formed as knock-out panels which, furthermore, respectively may be

10. attached to individual stores. The releasable hanger means are provided with remotely and individually actuatable detents engaging retaining lugs on the stores.

To effect deployment of the respective stores, the

15. associated detent is actuated from a remote location to release the store from the hanger means. The store falls, by the effect of gravity, and passes through the immediately subjacent portion of the outer casing skin, either rupturing the skin or effecting removal of the

20. associated panel. The stores are released in sequence until all of the stores have been deployed, whereupon, if desired, the stowage structure may be jettisoned by disengaging the attachment lugs on the stowage

25. structure from the attachment means on the sub-surface craft.

In a further alternative form (not shown) of the arrangement of Figures 7 and 8, the hanger supports are provided on the braced lattice stowage structure,

30. dispensing with the pallets. The stores are loaded directly on to the stowage structure, to hang from

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releasable hanger means provided with remotely and individually actuatable detents retaining lugs on the stores. Deployment of the respective stores and, if desired, subsequent jettisoning of the stowage structure is effected as described above.

In an alternative form of the attachment (not shown) the stowage structure is releasably attachable to the underside of the sub-surface craft at five attachment locations. Five, screw threaded, pintles are positioned with two laterally spaced apart at the forward end, two laterally spaced apart at the aft end and a fifth, which is of greater length than the others, adjacent the centre of the stowage structure. Five rotatable nut means are positioned in housings on the sub-surface craft to mate with the pintles on the stowage structure. Drive means to effect rotation of the nuts may be operable individually, in approximate unison, or may be mechanically interconnected to operate in unison.

In operation, the stowage structure is loaded with stores and located on the floor of the dock and the sub-surface craft floated in above the stowage structure as previously described. The level of water in the dock is then lowered such that the craft settles on to support stocks on the base of the dock with the screw threaded pintles on the stowage structure in registration with the rotatable nuts in the housings on the underside of the sub-surface craft, jacking means being used to provide small adjustments to the position

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of the stowage structure if necessary. Engagement of the pintles with the nuts is then effected, with the central, fifth, pindle engaging initially, and following rotation of the nuts, the remaining pintles
5. engaging to draw the structure up to the craft. The level of water in the dock is then again raised to enable the craft to be floated out of the dock.

The stowage structure is jettisonable from the
10. sub-surface craft, by rotating the five rotatable nuts in unison, or approximate unison. Since the central fifth, pindle is longer than the others, the other pintles dis-engage from the respective nuts prior to the central pindle and nut dis-engaging, thereby
15. avoiding the danger of an asymmetric dis-engagement.

In a yet further alternative form (not shown) of attachment, the stowage structure is releasably attachable to the underside of the sub-surface craft by
20. means of link lugs provided on the structure arranged to engage with aft facing, L-shaped, brackets provided on the underside of the craft together with a releasable retaining pin arranged, in the retaining position, to restrict aftwards movement of the
25. structure in relation to the craft. The brackets are positioned in laterally spaced apart pairs at longitudinal intervals from the forward end of the stowage structure, the longitudinal intervals being determined from consideration of the loadings upon the
30. brackets. The retaining pin is positioned on the underside of the craft and is movable between a position engaging the stowage structure and a

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- dis-engaged position permitting aftward movement of the stowage structure. Axial movement of the pin between the engaged and dis-engaged positions, in one arrangement, is effected by forming the pin with a
5. spline or keyway and a screw thread to co-act with a rotatable nut positioned upon the craft such that rotation of the nut effects raising or lowering of the pin.
 10. In operation, the stowage structure is loaded with stores and located on the floor of the dock and the sub-surface craft floated in above the stowage structure as previously described. The level of water in the dock is then lowered such that the craft settles
 15. on to support stocks on the base of the dock with the link lugs on the stowage structure in registration with the L-shaped brackets on the underside of the sub-surface craft, jacking means being used to provide small adjustments to the position of the stowage
 20. structure if necessary. Engagement of the link lugs with the brackets is then effected utilising the jacking means to move the structure forwardly relative to the craft. The retaining pin is then moved to the engaged position to restrain aftward movement of the structure,
 25. thereby ensuring that the link lugs remain in engagement with the brackets and the weight of the structure is transferred through the link lugs to the brackets and the craft. The level of water in the dock is then again raised to enable the craft to be floated
 30. out of the dock.

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The stowage structure is jettisonable from the sub-surface craft by moving the retaining pin to the dis-engaged position in which aftward movement of the structure is no longer restrained. With the sub-surface craft in motion, the drag effect on the stowage structure is sufficient to effect aftward movement of the structure, thereby dis-engaging the link lugs from the brackets and allowing the structure to fall-away from the craft.

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CLAIMS

1. Apparatus for stowing and deploying stores (28) from air and marine craft including a modular stowage structure for such stores, the stores being stowed on the structure, with releasable locking devices
5. (10,88) securing the structure to the craft, characterised in that further releasable locking devices (29) are arranged to secure the stores to respective associated portions of the structure and are adapted to permit, upon release of the respective
10. further releasable locking devices, movement of the stores to effect deployment of the stores.
2. Apparatus for stowing and deploying stores (28) from air and marine craft including modular
15. palletised stowage of such stores, the stores being stowed on pallets (32,34), with releasable locking devices (10) securing the pallets to the craft, characterised in that further releasable locking devices (29) are arranged to secure the stores to
20. respective associated pallets and the pallets are adapted to permit, upon release of the respective further releasable locking devices, movement by the effect of gravity of the stores to effect deployment of the stores.
- 25.
3. Apparatus for stowing and deploying stores (28) from air and marine craft including modular palletised stowage of such stores, the stores being stowed in cradles (14) mounted in pallets (32,34), with
30. releasable locking devices (10) securing the pallets characterised in that further releasable locking

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- devices (29) are arranged to secure the cradles (14) to respective associated pallets (32,34) and the cradles and pallets are adapted to permit, upon release of the respective further releasable locking devices (29),
5. movement by the effect of gravity of the cradles relative to the pallets to a deployment position and, also by the effect of gravity, to effect deployment of the cradles.
4. Apparatus for stowing and deploying stores from a
10. surface marine craft as claimed in Claim 2 or Claim 3, characterised in that a ramp structure (50,52) is provided on the craft and is formed with means (10) readily permitting releasable attachment of the pallets (32,34) to the ramp, the ramp having an inclination
15. sufficient to provide gravitational impetus to the cradles, upon release thereof, to effect movement and deployment of the cradles.
5. Apparatus for stowing and deploying stores from air or sub-surface marine craft as claimed in Claim 3,
20. characterised in that means (10) readily permitting releasable attachment to the craft of the pallets are provided such that the pallets are aligned with the longitudinal axis of the craft, the deployment position being at the rear of the craft and the pitch of the
25. craft being variable to an inclination at which movement by the effect of gravity of the cradles (14) towards the deployment position occurs.

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6. Apparatus as claimed in any one of Claims 2 to 5, characterised in that a modular structure (62) provided at the deployment position has means readily permitting releasable attachment to the craft and the adjoining rearmost pallet and means for effecting actuation of respective devices associated with the stores.

7. Apparatus as claimed in Claim 6, characterised in that the modular structure (62) includes means for releasing stores from the respective associated cradle.

8. Apparatus as claimed in Claim 7, characterised in that means (84) are provided to effect retention of the cradle on the craft following separation of the cradle from the stores.

9. Apparatus for stowing and deploying stores (28) from aircraft and surface marine craft including modular palletised stowage of such stores, the stores being stowed on cradles (14) mounted in pallets (32,34) and releasable locking devices (10) secure the pallets together and to the craft, characterised in that further releasable locking devices (29) are arranged to secure the cradles (14) to respective associated pallets (32,34) and the cradles and pallets are adapted to permit, upon release of the respective further releasable locking devices (29), movement as a longitudinally connected string of the cradles by the action of a reciprocable pulling device (64)

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connectable repetitively to a respective endmost cradle to move the endmost cradle from the endmost pallet to a transfer station, means to effect transfer of the endmost cradle from the transfer station to the
5. deployment position and means to effect the deployment of the cradles from the deployment position.

10. Apparatus as claimed in Claim 9, characterised in that the cradles are interconnected together by pin and
10. socket devices (60) at forward and rearward ends of the cradles such that vertical movement of the endmost cradle at the transfer station effects disengagement of the endmost cradle from the next adjacent cradle.

15. 11. Apparatus as claimed in Claim 10, characterised in that means are provided to effect lateral movement of the cradle from the transfer station to the deployment station.

20. 12. Apparatus as claimed in Claim 11, characterised in that further repetitively reciprocable means (64) are provided to effect deployment of the cradles from the deployment position.

25. 13. Apparatus as claimed in Claim 11, characterised in that means are provided to effect release of a store from an associated cradle and endless chain conveyor means (76) are engageable with the respective store (28) at the deployment position to effect deployment of the respective store following detachment from the associated cradle (14).

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14. Apparatus as claimed in any one of Claims 5 to 13, characterised in that means are provided at the deployment position to effect actuation of respective devices associated with the stores.

5.

15. Apparatus for stowing and deploying stores from a sub-surface marine craft as claimed in Claim 1, characterised in that there is provided a stowage structure (86) releasably attachable to the underside

10. of the sub-surface craft and adapted to accommodate the stores.

16 Apparatus as claimed in Claim 15, characterised in that the stowage structure (86) is floatatable, and of

15. braced lattice construction provided with an outer casing skin (90) and fore and aft fairings (92,94).

17. Apparatus as claimed in Claim 16, characterised in that the stowage structure (86) is provided with a

20. hanger support having releasable hanger means for individual pendant support of respective sources.

18. Apparatus as claimed in Claim 16, characterised in that panels in the outer casing skin (90) in

25 registration with the stores (28) are detachable from the stowage structure upon release of the stores.

19. Apparatus as claimed in Claim 18, characterised in that the panels are secured to the stores.

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20. Apparatus as claimed in Claim 19, characterised in that the panels are frangible, respectively being
5. adapted to fragment upon the associated store contacting the panel following release from the hanger means.
10. 21. Apparatus as claimed in any one of Claims 15 to 20, characterised in that the stowage structure (86) is releasably attachable to the underside of the sub-surface craft at five attachment locations, two of the attachment locations being laterally spaced apart
15. at the forward end of the structure, two of the attachment locations being laterally spaced apart at the aft end of the structure and the fifth location being adjacent the centre of the structure, attachment means at the fifth location being engageable between
20. the stowage structure and the sub-surface marine craft prior to engagement of attachment means at the fore and aft locations between the structure and the craft and dis-engageable subsequent to disengagement of the attachment means at the fore and aft locations.
25. 22. Apparatus as claimed in Claim 21, characterised in that the attachment means comprise pintles formed with screw threads and secured to the support structure and rotatable nut means mounted on the sub-surface craft,
30. the respective nuts and pintles being positioned to be engageable together.

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23. Apparatus as claimed in Claim 21, characterised in that the nuts are arranged to be rotatable in unison, the pintle at the fifth attachment means having a greater length than the pintles at the fore and aft locations.

24. Apparatus as claimed in any one of Claims 15 to 20, characterised in that the stowage structure is releasably attachable to the underside of the sub-surface craft at attachment locations comprising aft facing L-shaped brackets secured to the sub-surface craft in laterally spaced apart pairs at longitudinal intervals from the forward end of the support structure, with link lugs provided on the stowage structure arranged to engage upon the L-shaped brackets and a retaining pin movable between a position engaging the stowage structure to restrain aftward movement of the stowage structure relative to the sub-surface craft and a disengaged position at which aftward movement of the stowage structure is permitted.

25. Apparatus as claimed in Claim 24, characterised in that the retaining pin is formed with a spline or a keyway and a screw thread arranged to be engaged by a rotatable nut means mounted on the sub-surface craft, rotation of the nut being arranged to effect axial movement of the pin.

- 25 -

26. Apparatus as claimed in any preceding claim, characterised in that releasable restraining means (36) are provided on the storage structure to prevent movement of the stores (28) in a direction away from
5. the deployment position and to readily permit movement of the stores toward the deployment position.

27. Apparatus as claimed in Claim 26, characterised in that over-ride means (44) are provided on the
10. releasable restraining means (36) to release the restraining means and permit movement of the stores away from the deployment position.

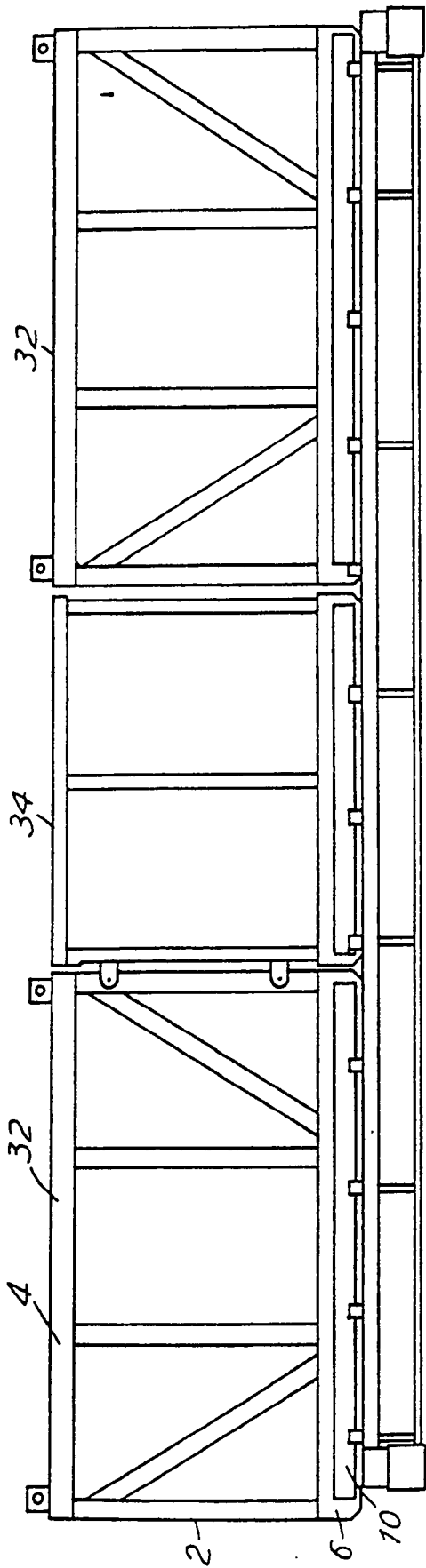


FIG. 1

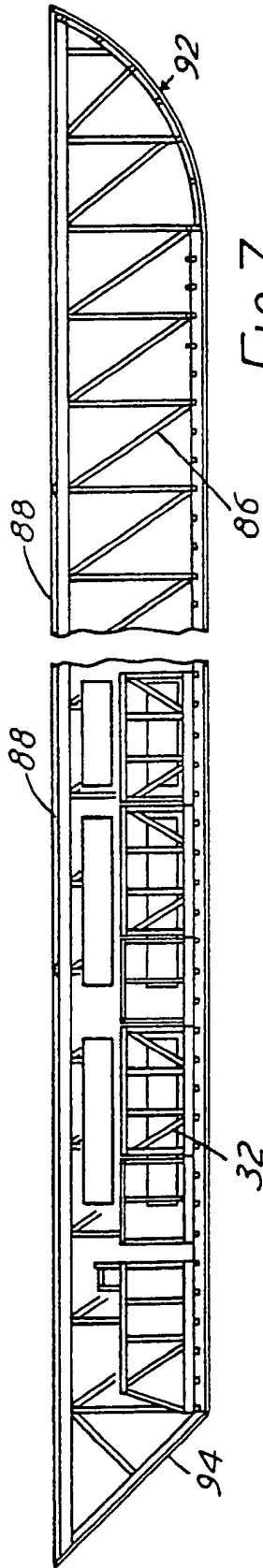


FIG. 7

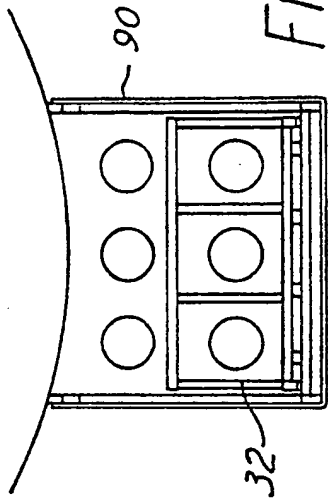


FIG. 8

2/5

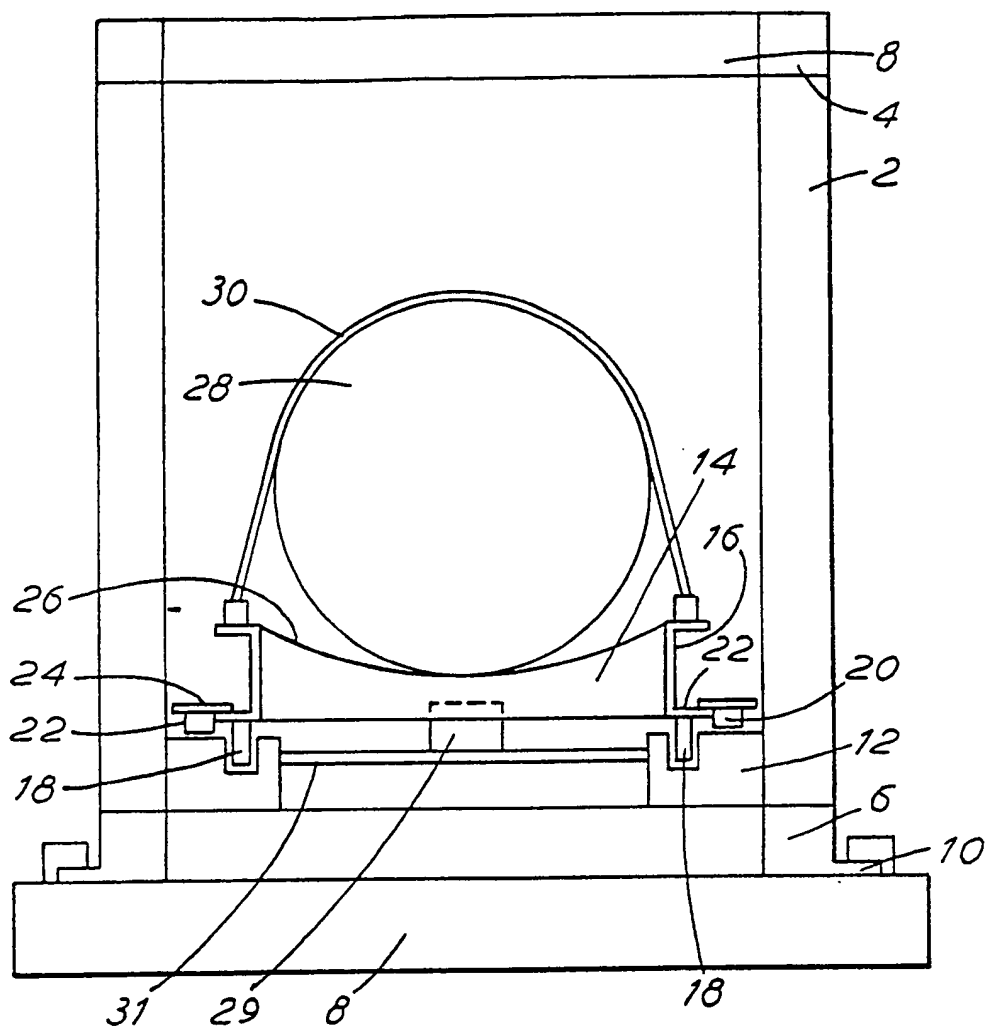


FIG. 2✓

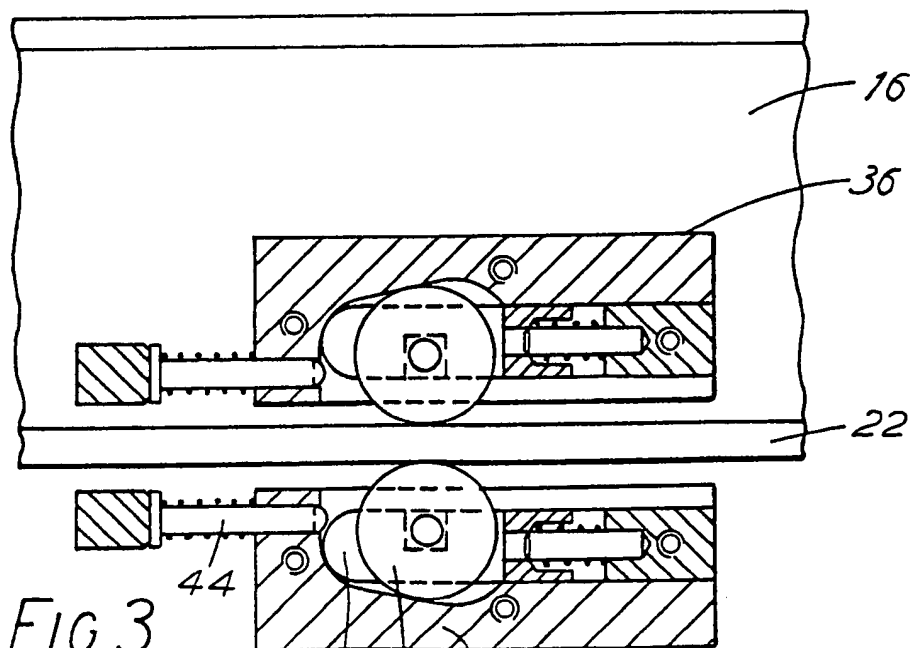


FIG. 3

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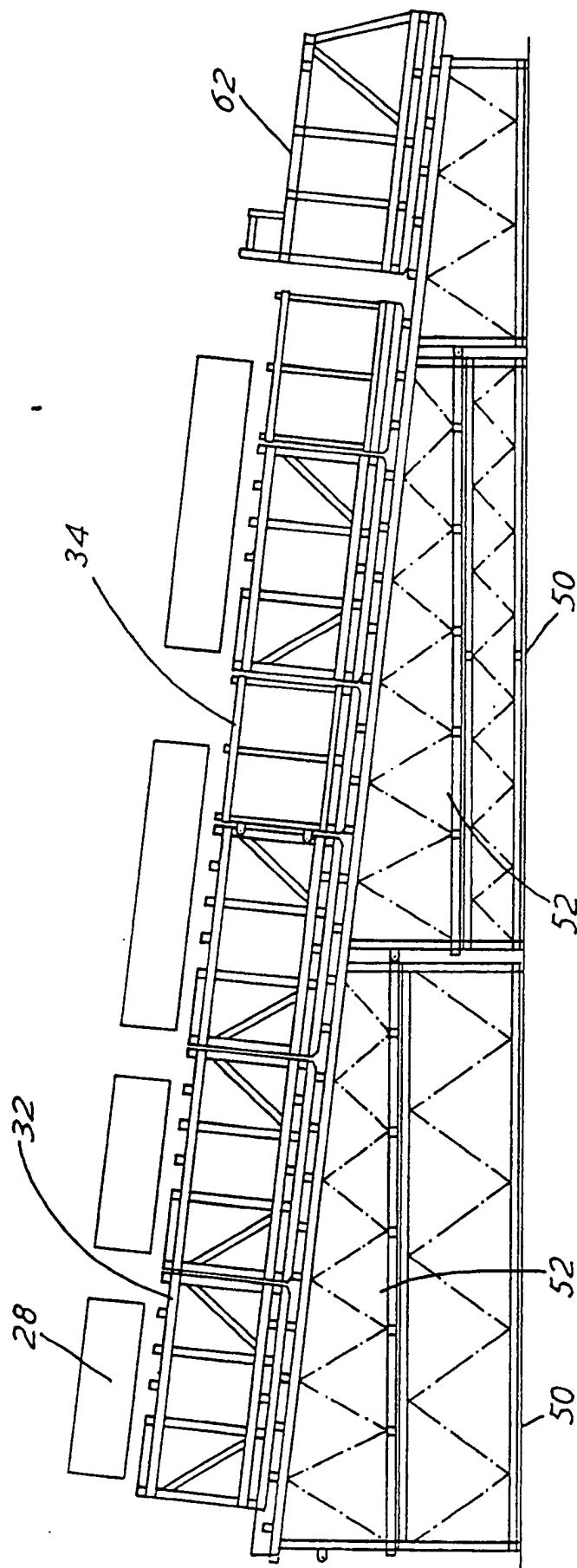
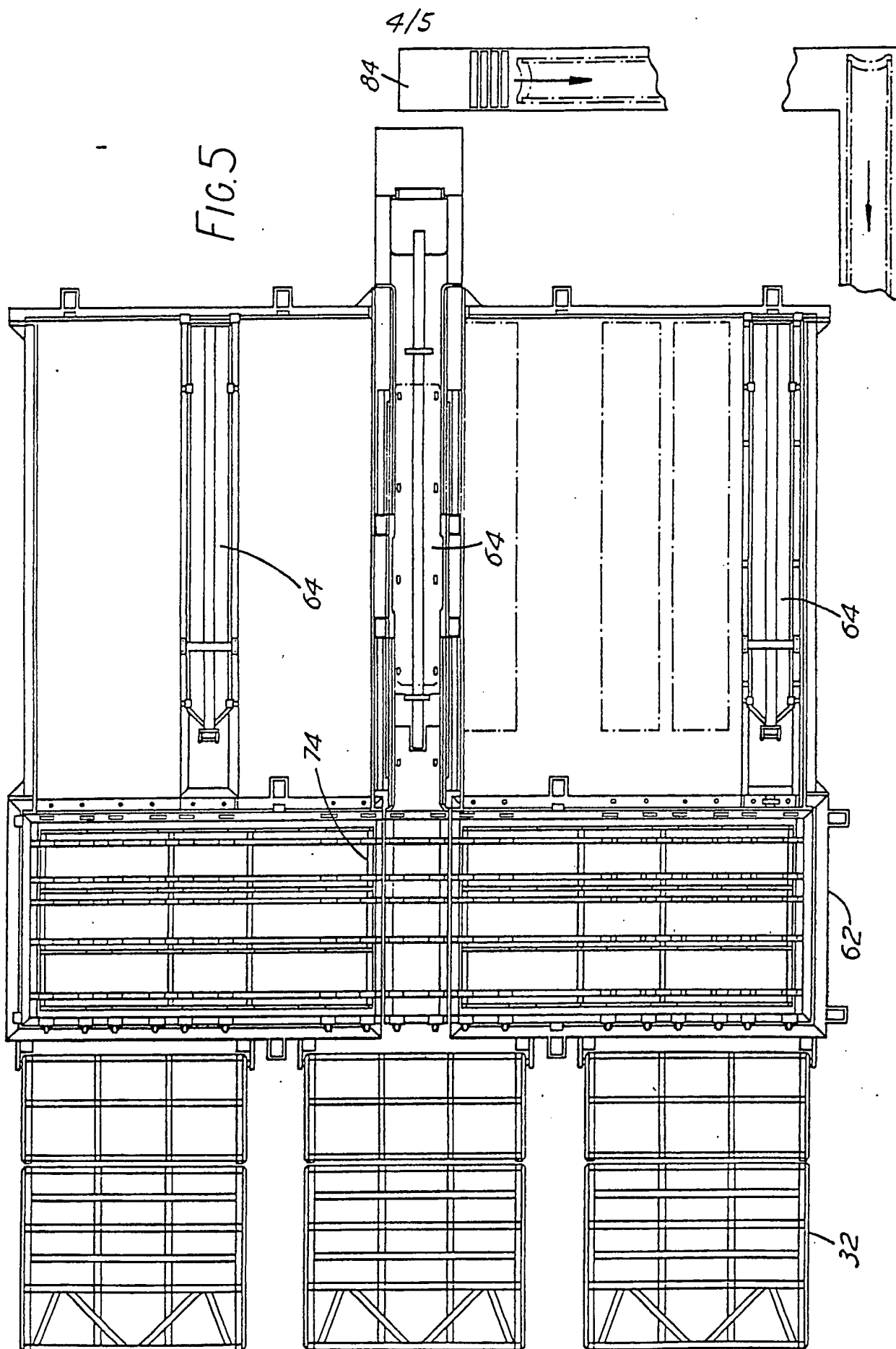


FIG. 4



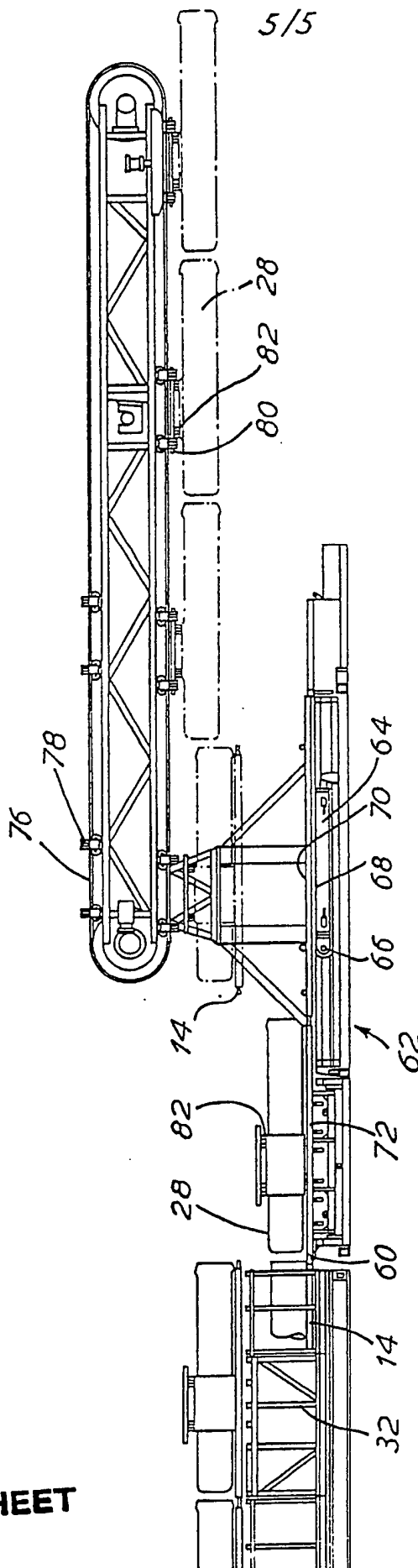


FIG. 6

INTERNATIONAL SEARCH REPORT

International Application No. **PCT/GB 88/00047**

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶ According to International Patent Classification (IPC) or to both National Classification and IPC IPC ⁴ : B 64 D 1/08; B 63 G 3/00																	
II. FIELDS SEARCHED <div style="text-align: right; font-size: small;">Minimum Documentation Searched ⁷</div> <table style="width: 100%; border: none;"> <tr> <td style="width: 25%; border: none; vertical-align: top;"> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> Classification System </div> <div style="border: 1px solid black; padding: 5px;"> IPC⁴ </div> </td> <td style="border: none; vertical-align: top;"> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> Classification Symbols </div> <div style="border: 1px solid black; padding: 5px;"> B 64 D; B 63 G </div> </td> </tr> </table> <div style="text-align: center; font-size: x-small; margin-top: 5px;"> Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸ </div>			<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> Classification System </div> <div style="border: 1px solid black; padding: 5px;"> IPC⁴ </div>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> Classification Symbols </div> <div style="border: 1px solid black; padding: 5px;"> B 64 D; B 63 G </div>													
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III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁹ <table border="1" style="width: 100%; border-collapse: collapse; font-size: x-small;"> <thead> <tr> <th style="width: 10%;">Category ¹⁰</th> <th style="width: 70%;">Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²</th> <th style="width: 20%;">Relevant to Claim No. ¹³</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td>US, A, 4256012 (COWART) 17 March 1981 see the whole document --</td> <td style="text-align: center; vertical-align: top;">1,2,4,5</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td>GB, A, 1074825 (G.Q. PARACHUTE CO.) 5 July 1967 see the whole document --</td> <td style="text-align: center; vertical-align: top;">1,9</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td>US, A, 2937573 (GANTSCHNIGG) 24 May 1960 see column 4, line 46 - column 5, line 11 --</td> <td style="text-align: center; vertical-align: top;">1</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td>US, A, 3056335 (THIEBLOT) 2 October 1962 see the whole document -----</td> <td style="text-align: center; vertical-align: top;">1</td> </tr> </tbody> </table>			Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³	A	US, A, 4256012 (COWART) 17 March 1981 see the whole document --	1,2,4,5	A	GB, A, 1074825 (G.Q. PARACHUTE CO.) 5 July 1967 see the whole document --	1,9	A	US, A, 2937573 (GANTSCHNIGG) 24 May 1960 see column 4, line 46 - column 5, line 11 --	1	A	US, A, 3056335 (THIEBLOT) 2 October 1962 see the whole document -----	1
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<div style="display: flex; justify-content: space-between; font-size: x-small;"> <div style="width: 45%;"> <p>[*] Special categories of cited documents: ¹⁶</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"G" document member of the same patent family</p> </div> </div>																	
IV. CERTIFICATION <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none; vertical-align: top;"> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> Date of the Actual Completion of the International Search </div> <div style="border: 1px solid black; padding: 5px; text-align: center;"> 29th April 1988 </div> <div style="border: 1px solid black; padding: 5px; text-align: center;"> International Searching Authority EUROPEAN PATENT OFFICE </div> </td> <td style="width: 50%; border: none; vertical-align: top;"> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> Date of Mailing of this International Search Report </div> <div style="border: 1px solid black; padding: 5px; text-align: center;"> 10 JUN 1988 </div> <div style="border: 1px solid black; padding: 5px;"> <div style="display: flex; justify-content: space-between;"> <div> Signature of Authorizing Officer </div> <div style="text-align: right;"> P.C.G. VAN DER PUTTEN </div> </div> </div> </td> </tr> </table>			<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> Date of the Actual Completion of the International Search </div> <div style="border: 1px solid black; padding: 5px; text-align: center;"> 29th April 1988 </div> <div style="border: 1px solid black; padding: 5px; text-align: center;"> International Searching Authority EUROPEAN PATENT OFFICE </div>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> Date of Mailing of this International Search Report </div> <div style="border: 1px solid black; padding: 5px; text-align: center;"> 10 JUN 1988 </div> <div style="border: 1px solid black; padding: 5px;"> <div style="display: flex; justify-content: space-between;"> <div> Signature of Authorizing Officer </div> <div style="text-align: right;"> P.C.G. VAN DER PUTTEN </div> </div> </div>													
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ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.

GB 8800047

SA 20450

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The members are as contained in the European Patent Office EDP file on 27/05/88
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 4256012	17-03-81	None	
GB-A- 1074825		None	
US-A- -2937573		None	
US-A- 3056335		None	

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